

REMARKS

Reconsideration and allowance of the above-amended application are respectfully requested.

In compliance with the Examiner's requirements, specification and drawings have been amended to correct typographical errors and informalities. No new matter is added. The objection to the drawings has now been overcome.

Claims 1, 10, 15, and 17-19 have been amended. In addition, Claims 26-29 have been newly added. Each of the amendments and new claims is fully supported by the original specification. Claims 1-29 are now pending and under consideration.

Claims 1-18 stand rejected under 35 USC 112, second paragraph, as allegedly being indefinite. The Patent Office is in the opinion that the structure as claimed does not sufficiently describe the shaping of the resonator, what the eccentricity should be and how it should be made (Office Action, page 3). Independent Claims 1, 10, 15, and 17 have been amended to clarify the claim language and to overcome this rejection.

Claim 1 as amended recites the resonator to be a spheroid which has "an equator in a circular cross section." In addition, Claim 1 as amended recites an eccentricity of the recited spheroid is "sufficiently large so that free spectral

ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude." Hence, Claim 1 as amended specifically recites the WG modes to circulate not only around the equator of the circular cross section but also "around a short ellipsoid axis of said spheroid." This structure is formed by revolving an ellipse around a symmetric axis along the short elliptical axis. See, e.g., FIG. 1 and the textual description on page 8 of the specification.

Clearly, the shape of the resonator as recited in the amended Claim 1 is a specific spheroid. Hence, Claim 1 as amended is definite in this regard.

The eccentricity of the recited spheroid is the eccentricity of ellipse from which the spheroid is formed by revolving along the short elliptical axis. The eccentricity is a well-known concept in mathematics and defined by an equation on page 8 of the specification. Claim 1 recites the eccentricity to be sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude. This is clearly described with respect

to degeneracy of two different sets of FSRs on pages 10-12 of the specification. Hence, Claim 1 is definite in this regards as well.

As for the Patent Office's contention that Claim 1 does not describe how it should be made, Applicants respectfully submit that this is not required under 35 USC 112, second paragraph, because Claim 1 is a device claim and hence only the structure of the device is required to be specified. The method of making the recited structure is irrelevant to such a device claim under 35 USC 112, second paragraph.

In short, Claim 1 as amended is definite and thus is patentable under 35 USC 112, second paragraph. The rejection should be withdrawn.

Accordingly, Claims 2-18 are patentable under 35 USC 112, second paragraph, based on the above arguments for Claim 1. More specifically, the eccentricity recited in Claim 2 is definite because the definition of eccentricity is well known in the art and is fully given in an equation on page 8 in the original specification. The dimension in Claim 9 is the size of the spheroid and hence is definite in its meaning.

We now address each rejection based on the cited prior art.

Claims 1-3 and 6-7 stand rejected under 35 USC 102(b) as being anticipated by Stone. Claims 1-3 and 6-7 as amended, however, are distinctly patentable over Stone.

Stone discloses asymmetric optical cavity where WGM modes travel in an oval shaped cross section. See, e.g., FIGS. 3A, 3B, 4, and 13 in Stone.

In contrast, Claim 1 as amended recites the resonator to be a spheroid which has "an equator in a circular cross section" and an eccentricity of the recited spheroid is "sufficiently large so that free spectral ranges of two different sets of whispering-gallery modes circulating along an equator in a circular cross section of said spheroid and around a short ellipsoid axis of said spheroid are compatible in magnitude." Hence, Claim 1 as amended specifically recites the WG modes to circulate not only around the equator of the circular cross section but also "around a short ellipsoid axis of said spheroid." Stone, therefore, fails to disclose these features of Claim 1 as amended. In fact, Stone teaches away from Claim 1 as amended.

Therefore, Claim 1 as amended is distinctly different from Stone and is patentable. Accordingly, Claims 2-3 and 6-7 are patentable over Stone.

Notably, the device in Claim 1 as amended is designed to, at least in part, make the free spectral ranges of two different sets of whispering-gallery modes circulating along the equator in the circular cross section to be compatible in magnitude. This is based on the recognition that additional lateral spatial confinement in the direction perpendicular to the circular cross section at the equator can change the spectrum of a WGM resonator formed from a sphere. Nothing in Stone suggests the recognition of such different sets of WGM modes and the unique cavity design in Claim 1 to achieve substantially equal FSRs for the two different sets of modes. In fact, the cavity geometry in FIGS. 3A in Stone provides less lateral spatial confinement than spherical surface. The geometry shown in FIG. 3B in Stone has a spherical lateral confinement. Hence, Claim 1 as amended is not only different in the device structure from Stone but also in the device function and output. This further supports that Claim 1 as amended is patentable over Stone.

Claim 19 stands rejected under 35 USC 102(b) over Stone. Claim 19 has been amended to clarify its language and to overcome this rejection.

Claim 19 as amended recites the region of said optical resonator to have "a circular cross section around which the whispering-gallery modes circulate." As discussed above, Stone

fails to disclose this feature by using an oval cross section. In addition, Claim 19 as amended recites the region also has a shape that is not part of a sphere to be spatially more restrictive than a spherical surface to the whispering-gallery modes in a direction perpendicular to the circular cross section. This specific combination of different geometries in Claim 19 as amended is entirely missing from Stone. Therefore, Claim 19 as amended is patentable over Stone.

Claims 4-5 stand rejected under 35 USC 103(a) over Stone in view of Little. As discussed above in connection with Claim 1, Stone fails to disclose each feature in Claims 4-5 because Claims 4-5 are based on Claim 1. Little certainly does not fill the voids left by Stone. Hence, the combined teaching of Stone and Little does not support the obviousness rejection. Claims 4-5 are therefore patentable.

Claims 10-18 are rejected under 35 USC 103(a) over Stone. Based on the arguments for Claim 1 as amended, Claims 10-18 as amended should also be patentable over Stone.

The Patent Office further rejects Claims 20-23 under 35 USC 102(a) over Flory in view of either Schiller or Little. Flory discloses a cylindrical resonator which is not part of a sphere. However, the amended base Claim 19 for Claims 20-23 recites a region with a shape to be spatially more restrictive than a

spherical surface to the whispering-gallery modes in a direction perpendicular to the circular cross section. Flory certainly fails to disclose this feature. Schiller and Little do not teach this either. Hence, Claims 20-23 are patentable over Flory in combination with either Schiller or Little.

Newly-added Claims 26-29 are also patentable over the prior art references discussed above based on the above arguments. Hence, all pending claims, 1-29, are now patentable.

In view of the above, each and every rejection or objection raised in the Office Action has been fully addressed and overcome. It is respectfully submitted that the application is now in full condition for allowance.

Attached is a check in the amount of \$162 for the excess claims. Please submit any additional charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,



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